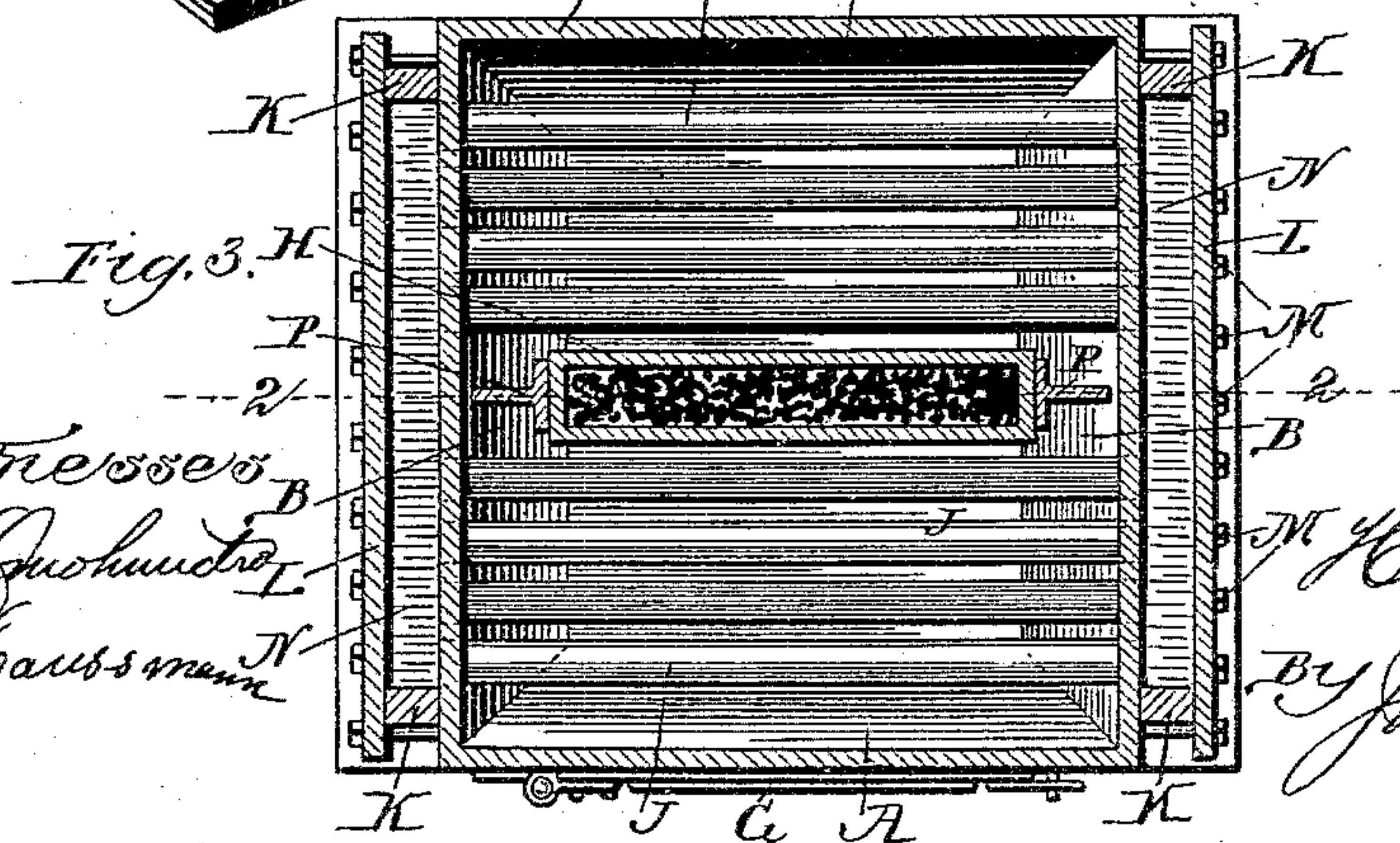
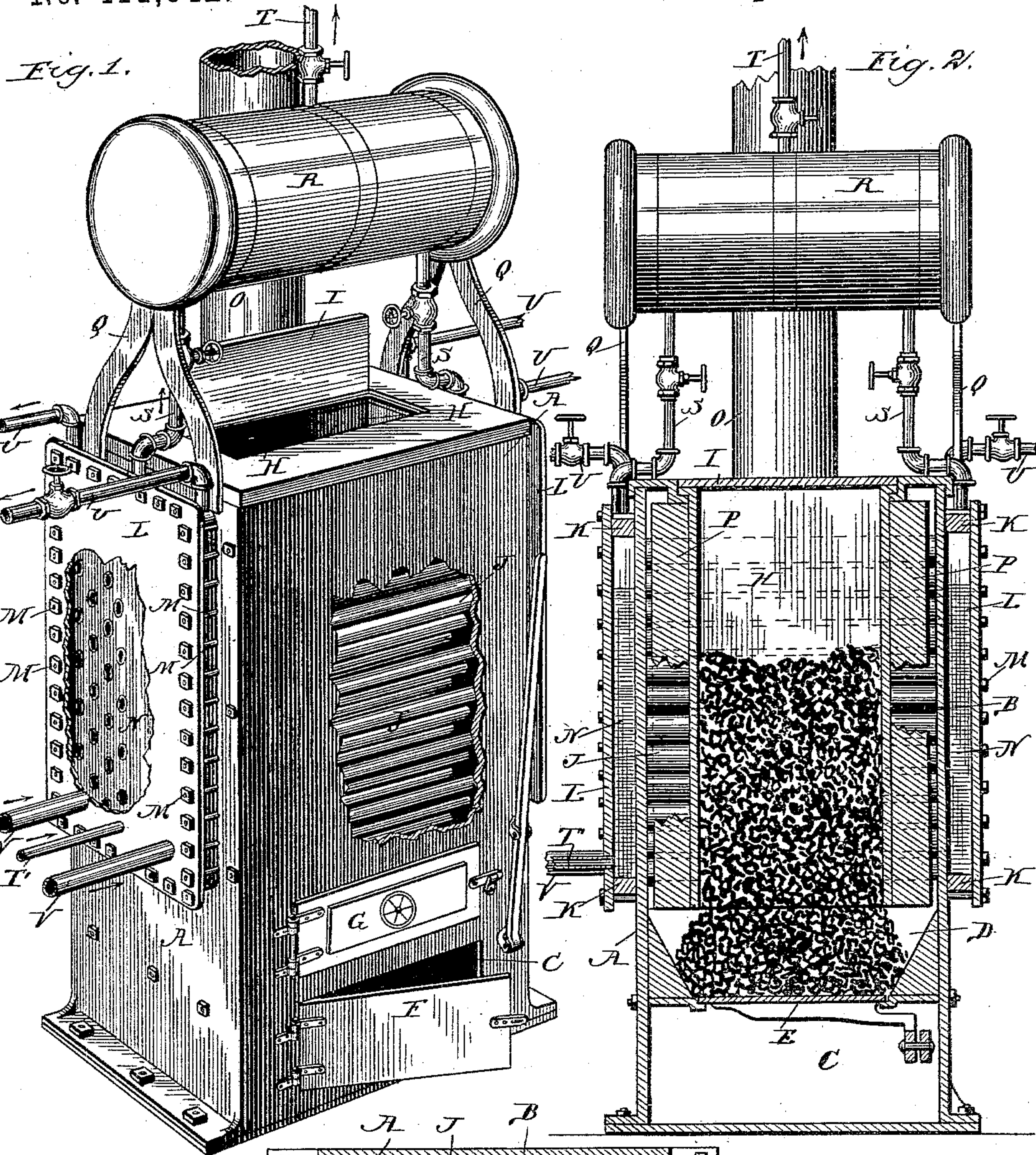


(No Model.)

H. M. CHAPMAN.
COMBINED STEAM AND HOT WATER BOILER.

No. 411,642.

Patented Sept. 24, 1889.



Witnesses
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UNITED STATES PATENT OFFICE.

HORACE M. CHAPMAN, OF CHICAGO, ILLINOIS.

COMBINED STEAM AND HOT-WATER BOILER.

SPECIFICATION forming part of Letters Patent No. 411,642, dated September 24, 1889.

Application filed March 11, 1889. Serial No. 302,881. (No model.)

To all whom it may concern:

Be it known that I, HORACE M. CHAPMAN, a citizen of the United States, residing in the city of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Combined Steam and Hot-Water Boilers, of which the following is a specification.

This invention relates to improvements in that class of boilers especially designed for use in connection with house-heating systems in which steam or hot water is employed as the heating medium and in which heretofore vertically-arranged water tubes or flues have been employed, terminating at their lower ends in a heating-chamber common to all of the pipes and at their upper ends in a water-chamber. The principal objection to such boilers is the lack of circulation due to the vertical arrangement of the pipes, which is rendered absolutely impossible should the water lying in the boiler for any reason fall below the upper ends of the water-flue, besides which under such circumstances there is great liability to explosion, due to the too rapid making of steam by the heating-flues, and especially when cold water is pumped into the boiler and flows into the heated and partly-empty flues. Besides this, the constant accumulation of precipitations from the water will soon clog the heated pipes to such an extent as to render them practically useless, or at best require the cleaning thereof at short intervals, with considerable loss of time and difficulty by reason of their peculiar arrangement.

The prime object of this invention is to secure the maximum heating-surface proportionate to the square feet of boiler-surface, and to have this heating-surface of such a character that there is at all times a thorough, rapid, and positive circulation of the water in the boiler regardless of the quantity of water contained therein.

Another object is to avoid the possibility of the accumulation in the water-flues of sediment or other precipitations from the water, and to have the settling-chambers of the boiler so located that they, as well as all the flues of the boiler, have the maximum convenience of access by the removal of a single plate.

Another object is to have the boiler so con-

structed that all of the water-flues will open at each end into a common water-chamber, whereby a positive and direct circulation is absolutely insured regardless of the quantity of water in the boiler.

A still further object is to not only have the heating-flues of the boiler pass through the heating or combustion chamber thereof, but also have a wall of the water-chamber constitute the wall of the heating-chamber, whereby the maximum heating-surface is obtained, and to have the heating or combustion chamber so arranged that the products of combustion will be deflected against the wall of the water-chamber before their exit from the heater, thus utilizing the products of combustion to the fullest extent; and, finally, to have the boiler of such construction that it is adapted for alternate use either as a steam or water boiler, and without the necessity in any manner altering or changing the construction thereof by combining therewith a separate steam-chamber for separating the steam generated from the water-chamber of the boiler.

I attain these objects by the devices illustrated in the accompanying drawings, in which—

Figure 1 represents a perspective view of a boiler embodying my invention; Fig. 2, a central vertical section thereof on a line 2 2 of Fig. 3, and Fig. 3 a slightly enlarged horizontal section.

Similar letters of reference indicate the same parts in the several figures of the drawings.

Referring by letter to the accompanying drawings, A indicates the main shell or casing of the boiler, preferably square or rectangular in shape, and composed of four vertical plates bolted or otherwise rigidly secured, this shell being divided horizontally into two main compartments B C, the former a combustion-chamber, in the bottom part of which is located the fire-box D and grate E, and the latter an ash-pit underlying the grate, to which access may be gained through the door F or in any other suitable manner. Access to the fire-box is gained through the usual door G, preferably located immediately above the ash-pit door F.

Within the combustion-chamber and sus-

5 depended from the top of the boiler is a rectangular magazine H, of nearly the width of said chamber and extending down to the fire-box, terminating a sufficient distance above the grate for the purposes of combustion. This magazine at its upper end is provided with a cover I, and renders the boiler self-feeding, because the magazine may be filled with coal, which will feed down to the fire as rapidly as consumed, just as in the case of an ordinary self-feeding cylinder stove. Arranged at each side of the magazine and extending from plate to plate of the boiler are arranged a number of vertical series of flues J, which, however, have no communication with the combustion-chamber, but simply pass therethrough and have their ends terminating flush with the outer faces of the plates or side walls of the boiler. Opposing the ends of these flues, but held a short distance therefrom by means of a ring or web K, are supplemental plates L, between which and the side walls of the plates or boiler the rings are interposed, these supplemental plates being rigidly secured in position upon the rings by means of a series of bolts M, lying close against the outside instead of passing through the ring, which bolts, however, when the plate is removed, serve to sustain the rings in position. The space between the side and supplemental plates constitute water-chambers N, with which all of the water-tubes of the boiler have common communication, all of the tubes at one end opening into one of the chambers and at their opposite ends into the other chambers, it being understood that the tubes are arranged horizontally in the boiler, while the water-chamber extends vertically, spanning all of the tubes.

40 From the foregoing it will be observed that the side walls of the boiler proper constitute one wall of the heating-chamber, the opposing wall being furnished by the supplemental plate, and that the products of combustion, which escape out of the smoke-stack O, at the top of the boiler, will serve to heat the inner walls of the water-chambers as well as the tubes J, passing through the combustion-chamber; but in order that the heat of the products of combustion may be utilized to the fullest extent I propose to deflect and force them into direct contact with the side walls thereof before their exit from the combustion-chamber, and to this end attach to the magazine at each side thereof wings or flanges P, extending nearly to the walls and the entire height of the magazine, and in conjunction therewith serve to divide the combustion-chamber into two parts and force all of the products at the front side thereof to pass around them and against the inner walls of the water-chambers before passing into the rear part and out of the heater, which arrangement not only retains the products of combustion in the heater sufficiently long to utilize all of the available heat thereof upon

the water-tubes, but also upon the water-chambers direct.

Immediately above the boiler and supported upon brackets Q, attached thereto, is a steam-chest R, connected by valve-pipes S with the upper part of the water-chambers at each side of the boiler, preferably through the ring K, so that all of the steam generated in the boiler may be drawn off therefrom into the steam-chest, and from there distributed through the supply-pipe T to all of the radiators in the house; but whenever it is desired to dispense with the use of steam as a heating medium the valve-pipes S and T may be closed, the steam-chest cut out, and the water-chambers of the boiler entirely filled; but when steam is to be made either for heating or any other domestic purpose the boiler is preferably filled with water only about to the water-line, (shown in Fig. 2,) leaving a slight steam-space in the water-chambers above the surface of the water for the further heating and drying of the steam before it is drawn off and dried in the steam-chest. The steam after passing through the house-heating system is returned to the water-chambers at the bottom thereof through the return-pipes T'. When hot water is employed as the heating medium, and it may connect with the same system of radiators employed for steam, it flows out to the radiators through the valve-pipes U, connecting with the top of the water-space, preferably through the ring K, as do the steam-pipes S, and returns thereto through the pipes U V, connecting with the water-chambers near the bottoms thereof.

From the foregoing it will be readily understood that a rapid transition from steam to hot-water heating, or vice versa, may be easily and quickly effected with the same pipes, radiators, &c., by simply operating the valves of the various pipes, besides which, when hot water is used as the heating medium it can be quickly cut off, sufficient steam generated for laundry or other domestic purposes, and the water-heating system resumed before a perceptible variation in the temperature of the house will occur.

Besides the advantages of this boiler hereinbefore set forth, there is the advantage of a quick, positive, and rapid circulation of the water in the boiler, which of itself renders the flue self-cleaning, besides giving such circulation at all times, regardless of the height or quantity of water in the boiler, thereby preventing over-production or too rapid making of steam in the boiler, besides which the danger of explosion of the boiler is reduced to the minimum by the heavy plates composing the same, the equalization of the steam and water pressure as a result of the peculiar construction of the boiler, and the combination therewith of the storage or expansion chest for the steam, which not only relieves the boiler, but also permits, if desired, the entire water-space to be filled and

thereby utilize the heat of the boiler to the maximum extent. A further advantage is the facility with which access may be gained to all the water-spaces, the bottoms of which
5 constitute settling-chambers for removing the settlings therefrom, and also for replacing flues or tubes that may be damaged accidentally or otherwise, which may be accomplished by simply unbolting and removing
10 one or both of the supplemental plates constituting the outer walls of the water-chambers and without disturbing any other portion of the boiler.

In conclusion, I may state that if desired
15 the magazine might be dispensed with, and a surface fire employed instead thereof with equally good results, for the only purpose of this magazine is to render the heater self-feeding; and if the magazine be dispensed
20 with, if found desirable to force the products of combustion against the walls of the water-chambers, a central plate—in effect a continuation of the wings P—might be substituted instead thereof and suspended in the
25 combustion-chamber in any well-known and convenient manner, and thereby fully subserve the intended purpose.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a combined steam and hot-water 30 boiler, the combination, with an internal vertical heating-chamber, a magazine located centrally therein, and external water-chambers, of a series of horizontal tubes passing through said heating-chamber at each side of 35 the magazine and opening at their ends in said water-chambers, substantially as described.

2. In a combined steam and hot-water boiler, the combination, with a vertical inter- 40 nal heating-chamber, a magazine located centrally therein, and wings or plates on said magazine extending nearly to the walls of said chamber, and external water-chambers opposing said wings, of a series of horizontal 45 tubes passing through the heating-chamber at each side of the magazine and opening into said water-chambers, substantially as described.

HORACE M. CHAPMAN.

Witnesses:

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